



SEQUENCE LISTING

<110> HOFFMAN, PAUL S.
GOODWIN, AVERY

<120> NOVEL NITROREDUCTASE AND THERAPEUTIC USES THEREOF

<130> DALHO1270-2

<140> 09/647,661

<141> 2001-01-31

<150> PCT/US99/07546

<151> 1999-04-06

<160> 23

<170> PatentIn Ver. 3.2

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<212> DNA

<213> Helicobacter pylori

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Arg Arg Gln Leu Leu Asn Glu Arg His Ser Cys Lys Met Phe Asp Ser
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cat tat gag ttt tct agt gaa gaa tta gaa gaa atc gct gaa atc gcc 270
His Tyr Glu Phe Ser Ser Glu Glu Leu Glu Glu Ile Ala Glu Ile Ala
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Arg Leu Ser Pro Ser Ser Tyr Asn Thr Gln Pro Trp His Phe Val Met
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Val Thr Asn Lys Asp Leu Lys Lys Gln Ile Ala Val His Ser Tyr Phe
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Tyr Pro Glu Ser Tyr Lys Val Arg Val Ile Pro Ser Phe Ala Gln Met
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ctt ggc gtg aga ttc aac cac agc atg caa aga tta gaa agc tat att 558
Leu Gly Val Arg Phe Asn His Ser Met Gln Arg Leu Glu Ser Tyr Ile
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tta gag caa tgc tat atc gct gtg ggg caa att tgc atg ggc gtg agc 606
Leu Glu Gln Cys Tyr Ile Ala Val Gly Gln Ile Cys Met Gly Val Ser
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tta atg gga ttg gat agt tgc att att gga ggc ttt gat cct tta aaa 654
Leu Met Gly Leu Asp Ser Cys Ile Ile Gly Gly Phe Asp Pro Leu Lys
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gtg ggt gaa gtt tta gaa gag cgt atc aat aag cct aaa atc gca tgc 702
Val Gly Glu Val Leu Glu Glu Arg Ile Asn Lys Pro Lys Ile Ala Cys
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ttg atc gct ttg ggc aag agg gtg gca gaa gcg agc caa aaa tca aga 750
Leu Ile Ala Leu Gly Lys Arg Val Ala Glu Ala Ser Gln Lys Ser Arg
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aaa tca aaa gtt gat gcg att act tgg ttg tgattaagca aaatcaaaaa 800
Lys Ser Lys Val Asp Ala Ile Thr Trp Leu
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<212> PRT
<213> Helicobacter pylori

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Met Lys Phe Leu Asp Gln Glu Lys Arg Arg Gln Leu Leu Asn Glu Arg
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His Ser Cys Lys Met Phe Asp Ser His Tyr Glu Phe Ser Ser Glu Glu
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Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
   35                      40                      45

Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Leu Lys Lys
   50                      55                      60

Gln Ile Ala Val His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
   65                      70                      75                      80

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Ser	Ala	Leu	Met	Val	Val	Cys	Ser	Leu	Arg	Pro	Ser	Glu	Leu	Leu	Pro	
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Val	Ile	Pro	Ser	Phe	Ala	Gln	Met	Leu	Gly	Val	Arg	Phe	Asn	His	Ser	
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Ile	Gly	Gly	Phe	Asp	Pro	Leu	Lys	Val	Gly	Glu	Val	Leu	Glu	Glu	Arg	
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Ala	Glu	Ala	Ser	Gln	Lys	Ser	Arg	Lys	Ser	Lys	Val	Asp	Ala	Ile	Thr	
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Trp	Leu															
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His Ser Cys Lys Met Phe Asp Ser His Tyr Glu Phe Ser Ser Glu Glu
          20          25          30

Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
      35          40          45

Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Leu Lys Lys
  50          55          60

Gln Ile Ala Ala Val Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
  65          70          75          80

Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
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His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
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Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
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Met Gln Arg Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
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Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175

Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190

Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205

Trp Leu
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 <213> Helicobacter pylori

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 20 25 30

Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
 35 40 45

Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Val Lys Asn
 50 55 60

Gln Ile Ala Thr His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80

Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95

His Gly His Tyr Met Gln Asn Leu Tyr Ser Glu Ser Tyr Lys Val Arg
 100 105 110

Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125

Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140

Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Ile Leu Glu Gln Arg
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Ala Glu Ala Ser
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 20 25 30

Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
 35 40 45

Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Val Lys Asn
 50 55 60

Gln Ile Ala Thr His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80

Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95

His Gly His Tyr Met Gln Asn Leu Tyr Ser Glu Ser Tyr Lys Val Arg
 100 105 110

Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125

Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140

Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Ile Leu Glu Gln Arg
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Ala Glu Ala Ser
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 Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Pro Tyr Asn
 35 40 45
 Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Leu Lys Lys
 50 55 60
 Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Lys Pro Ser Glu Leu Ser Pro
 85 90 95
 His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125
 Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140
 Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160
 Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175
 Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190
 Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Ile Asp Ala Lys Leu
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 Gly Cys Asp
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 20 25 30
 Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
 35 40 45
 Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Leu Lys Lys
 50 55 60
 Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Lys Pro Ser Glu Leu Leu Pro
 85 90 95
 His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Ser Phe Thr Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125
 Met Gln Arg Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140
 Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160
 Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175
 Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190
 Ala Glu Ala Ser Pro Lys Ile Gln Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205
 Trp Leu
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<210> 8

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<212> PRT

<213> *Helicobacter pylori*

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 20 25 30
 Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
 35 40 45

Thr Gln Pro Trp His Phe Val Met Val Ala Asn Lys Asp Leu Lys Lys
 50 55 60
 Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95
 His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Leu Phe Ser Lys Cys Leu Ala
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<400> 9
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 His Ser Cys Lys Met Phe Asp Ser His Tyr Glu Phe Ser Ser Glu Glu
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 35 40 45
 Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Leu Lys Lys
 50 55 60
 Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95
 Tyr Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Ser Phe Ala Gln Met Leu Gly Thr Arg Phe Asn His Ser
 115 120 125
 Met Gln Arg Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140
 Val Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160
 Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175
 Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
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Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
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Trp Leu
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<213> *Helicobacter pylori*

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Met Lys Phe Leu Asp Gln Glu Lys Arg Arg Gln Leu Leu Asn Glu Arg
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 20 25 30

Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
 35 40 45

Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Leu Lys Lys
 50 55 60

Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80

Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95

Tyr Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110

Val Ile Pro Ser Phe Ala Gln Met Leu Gly Thr Arg Phe Asn His Ser
 115 120 125

Met Gln Arg Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140

Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175

Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190

Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205

Trp Leu
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 35 40 45
 Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Val Lys Lys
 50 55 60
 Gln Ile Ala Val His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Thr
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95
 His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125
 Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140
 Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160
 Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Ile Leu Glu Glu Arg
 165 170 175
 Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190
 Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205
 Trp Leu
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 <213> Helicobacter pylori

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 35 40 45
 Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Val Lys Lys
 50 55 60
 Gln Ile Ala Val His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95
 His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125
 Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140
 Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160
 Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Ile Leu Glu Glu Arg
 165 170 175
 Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190
 Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205
 Trp Leu
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<210> 13
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 <213> Helicobacter pylori

<400> 13
 Met Lys Phe Leu Asp Gln Glu Lys Arg Arg Gln Leu Leu Asn Glu Arg
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 His Ser Cys Lys Met Phe Asp Ser His Tyr Glu Phe Ser Ser Thr Glu
 20 25 30
 Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Cys Asn
 35 40 45

Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Leu Lys Lys
 50 55 60
 Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Lys Pro Ser Glu Leu Leu Pro
 85 90 95
 His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125
 Met Gln Arg Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Thr Val
 130 135 140
 Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160
 Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175
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 180 185 190
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 Trp Leu
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 35 40 45
 Thr Gln Pro Trp His Phe Val Met Val Thr Asn Lys Asp Leu Lys Lys
 50 55 60
 Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Lys Pro Ser Glu Leu Leu Pro
 85 90 95

His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125
 Met Gln Arg Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140
 Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160
 Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175
 Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190
 Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205
 Trp Leu
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 <213> *Helicobacter pylori*

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 35 40 45
 Thr Gln Pro Trp His Phe Val Ile Val Thr Ser Lys Asp Leu Lys Asn
 50 55 60
 Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80
 Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95
 His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110
 Val Ile Pro Ser Phe Ser Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125

Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140

Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175

Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190

Ala Glu Ala Ser Gln Lys Ser Gly Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205

Trp Leu
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 20 25 30

Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
 35 40 45

Thr Gln Pro Trp His Phe Val Ile Val Thr Ser Lys Asp Leu Lys Asn
 50 55 60

Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80

Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95

His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110

Val Ile Pro Ser Phe Ser Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125

Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140

Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175

Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190

Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205

Trp Leu
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<213> Helicobacter pylori

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 20 25 30

Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
 35 40 45

Thr Arg Pro Trp His Phe Val Val Val Thr Asn Lys Asp Leu Glu Lys
 50 55 60

Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65 70 75 80

Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
 85 90 95

His Ser His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
 100 105 110

Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
 115 120 125

Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
 130 135 140

Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
 145 150 155 160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
 165 170 175

Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
 180 185 190

Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
 195 200 205

Trp Leu
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<213> *Helicobacter pylori*

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Met Lys Phe Leu Asp Gln Glu Lys Arg Arg Gln Leu Leu Asn Glu Arg
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20 25 30

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35 40 45

Thr Gln Pro Trp His Phe Val Val Val Thr Asn Lys Asp Leu Lys Lys
50 55 60

Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
65 70 75 80

Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
85 90 95

His Ser His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
100 105 110

Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
115 120 125

Met Gln Lys Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
130 135 140

Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
145 150 155 160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
165 170 175

Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
180 185 190

Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
195 200 205

Trp Leu
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 <223> Description of Artificial Sequence: Primer

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 1 5

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<212> PRT

<213> *Helicobacter pylori*

<400> 23

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Met Lys Phe Leu Asp Gln Glu Lys Arg Arg Gln Leu Leu Asn Glu Arg
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His Ser Cys Lys Met Phe Asp Ser His Tyr Glu Phe Ser Ser Thr Glu
      20          25          30

Leu Glu Glu Ile Ala Glu Ile Ala Arg Leu Ser Pro Ser Ser Tyr Asn
 35          40          45

Thr Gln Pro Trp His Phe Val Met Val Thr Asp Lys Asp Leu Lys Lys
 50          55          60

Gln Ile Ala Ala His Ser Tyr Phe Asn Glu Glu Met Ile Lys Ser Ala
 65          70          75          80

Ser Ala Leu Met Val Val Cys Ser Leu Arg Pro Ser Glu Leu Leu Pro
      85          90          95

His Gly His Tyr Met Gln Asn Leu Tyr Pro Glu Ser Tyr Lys Val Arg
      100          105          110

Val Ile Pro Ser Phe Ala Gln Met Leu Gly Val Arg Phe Asn His Ser
      115          120          125

Met Gln Arg Leu Glu Ser Tyr Ile Leu Glu Gln Cys Tyr Ile Ala Val
      130          135          140

Gly Gln Ile Cys Met Gly Val Ser Leu Met Gly Leu Asp Ser Cys Ile
      145          150          155          160

Ile Gly Gly Phe Asp Pro Leu Lys Val Gly Glu Val Leu Glu Glu Arg
      165          170          175

Ile Asn Lys Pro Lys Ile Ala Cys Leu Ile Ala Leu Gly Lys Arg Val
      180          185          190

Ala Glu Ala Ser Gln Lys Ser Arg Lys Ser Lys Val Asp Ala Ile Thr
      195          200          205

Trp Leu
      210

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